

What is claimed is:

1. A device for the volumetric measurement and dispensing of liquids comprising:

- a. a variable volume chamber,
- b. a means for controllably adjusting the volume of said variable volume chamber,
- c. a plurality of valves,
- d. at least one conduit disposed between said variable volume chamber and at least one of said plurality of valves, and
- e. a means for removing gas from a system formed by said variable volume chamber, said plurality of valves, and said at least one conduit,

whereby liquid aspirated into said system substantially fills said system thereby minimizing the difference between the volume of the aspirated liquid and the volume of said system.

2. The device of claim 1, wherein said device further comprises a means to detect the presence or absence of liquid in said at least one conduit,

whereby the precise location of liquid in relation to said plurality of valves and said variable volume chamber may be determined.

3. The device of claim 1, wherein said device further comprises a controller,

whereby said controller is in communication with said means for controllably adjusting the volume of said variable volume chamber, and a means for actuating said plurality of valves.

4. The device of claim 2, wherein said device further comprises a controller,

whereby said controller is in communication with said means to detect the presence or absence of liquid in said at least one conduit, said means for controllably adjusting the volume of said variable volume chamber, and a means for actuating said plurality of valves.

5. The device of claim 1, wherein said variable volume chamber further comprises:
- a. a cavity of uniform cross section with respect to the longitudinal axis of said cavity,
  - b. an opening at one end of the longitudinal axis of said cavity,
  - c. an orifice of cross sectional area equal to or less than the cross sectional area of said cavity located at the end opposite to said opening, and
  - d. a member slidably engaged in said cavity having a geometry substantially conforming to the geometry of said cavity,

whereby said member may be retracted from said orifice of said cavity to aspirate liquid into said cavity, and said member may be advanced toward said orifice to expel liquid from said cavity.

6. The device of claim 1, wherein said variable volume chamber further comprises:
- a. a cylinder,
  - b. a piston slidably engaged in said cylinder,
  - c. an orifice located at one end of said cylinder, and
  - d. a means to create a seal between said piston and said cylinder,

whereby said piston may be retracted from said orifice of said cylinder to aspirate liquid into said cylinder, and said piston may be advanced toward said orifice to expel liquid from said cylinder.

7. The device of claim 1, wherein at least one of said plurality of valves is in fluid communication with both said variable volume chamber and a body of gas disposed external to the volume defined by the interior of said system,  
  
whereby gas may be controllably expelled into said body of gas from said system or aspirated into said system from said body of gas.
8. The device of claim 7, wherein at least one of said plurality of valves is in fluid communication with both said variable volume chamber and a body of liquid,  
  
whereby liquid may be controllably aspirated into or expelled from said variable volume chamber from or to said body of liquid.
9. The device of claim 1, wherein said means for removing gas from said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit further comprises a means to minimize the free volume of said system prior to aspiration of a liquid.
10. The device of claim 1, wherein said means for removing gas from said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit further comprises a means to substitute liquid for gas within said system by controllably adjusting the volume of said variable volume chamber in conjunction with the actuation of at least one of said plurality of valves.
11. The device of claim 1, wherein said means for removing gas from said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit further comprises a means to substitute liquid for gas within said system while maintaining a constant volume within said system.

12. The device of claim 1, wherein said means for removing gas from said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit further comprises a means to controllably create a vacuum within said system,

whereby liquid aspirated into said system will completely fill the free volume of said system.

13. The device of claim 2, wherein said variable volume chamber further comprises:

- a. a cavity of uniform cross section with respect to the longitudinal axis of said cavity,
- b. an opening at one end of the longitudinal axis of said cavity,
- c. an orifice of cross sectional area equal to or less than the cross sectional area of said cavity located at the end opposite to said opening, and
- d. a member slidably engaged in said cavity having a geometry substantially conforming to the geometry of said cavity,

whereby said member may be retracted from said orifice of said cavity to aspirate liquid into said cavity, and said member may be advanced toward said orifice to expel liquid from said cavity.

14. The device of claim 2, wherein at least one of said plurality of valves is in fluid communication with both said variable volume chamber and a body of gas disposed external to the volume defined by the interior of said system,

whereby gas may be controllably expelled into said body of gas from said system or aspirated into said system from said body of gas.

15. The device of claim 2, wherein said means for removing gas from said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit further comprises a means to substitute liquid for gas within said system by

controllably adjusting the volume of said variable volume chamber in conjunction with the actuation of at least one of said plurality of valves.

16. The device of claim 3, wherein said device further comprises:

a. said variable volume chamber further comprising:

1. a cavity of uniform cross section with respect to the longitudinal axis of said cavity,
2. an opening at one end of the longitudinal axis of said cavity,
3. an orifice of cross sectional area equal to or less than the cross sectional area of said cavity located at the end opposite to said opening, and
4. a member slidably engaged in said cavity having a geometry substantially conforming to the geometry of said cavity,

whereby said member may be retracted from said orifice of said cavity to aspirate liquid into said cavity, and said member may be advanced toward said orifice to expel liquid from said cavity,

b. at least one of said plurality of valves is in fluid communication with both said variable volume chamber and a body of gas disposed external to the volume defined by the interior of said system,

whereby gas may be controllably expelled into said body of gas from said system or aspirated into said system from said body of gas, and

c. a means to controllably create a vacuum within said system,

whereby liquid aspirated into said system will completely fill the free volume of said system.

17. The device of claim 4, wherein said device further comprises:

a. said variable volume chamber further comprising:

1. a cylinder,

2. a piston slidably engaged in said cylinder,
3. an orifice located at one end of said cylinder, and
4. a means to create a seal between said piston and said cylinder,

whereby said piston may be retracted from said orifice of said cylinder to aspirate liquid into said cylinder, and said piston may be advanced toward said orifice to expel liquid from said cylinder,

- b. at least one of said plurality of valves is in fluid communication with both said variable volume chamber and a body of gas disposed external to the volume defined by the interior of said system,

whereby gas may be controllably expelled into said body of gas from said system or aspirated into said system from said body of gas, and

- c. a means to substitute liquid for gas within said system by controllably adjusting the volume of said variable volume chamber in conjunction with the actuation of at least one of said plurality of valves.

18. A method to measure the volume of a liquid comprising the steps of:

- a. providing a variable volume chamber in fluid communication with a plurality of valves, and having at least one conduit disposed between said variable volume chamber and said plurality of valves,
- b. removing gas from a system formed by said variable volume chamber, said plurality of valves, and said at least one conduit, and
- c. aspirating a volume of liquid into said system through adjustment of the volume of said variable volume chamber,

whereby the known volume of said system formed by said variable volume chamber, said plurality of valves, and said at least one conduit, in conjunction with the complete filling of said system result in an accurate measurement of the aspirated volume of liquid.

19. The method of claim 18, wherein said method further comprises the step of dispensing the measured liquid into a container by providing a means to expel the liquid from said system.